

Squamata reptiles of a fragment of tropical dry forest in northwestern Venezuela (Lake Maracaibo region)

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ABSTRACT: We present a commented taxonomic list of the reptiles found during herpetological surveys carried out in an isolated fragment of tropical dry forest located in the municipality of San Francisco, Zulia state, northwestern Venezuela between January-December 2011. We report a total of 24 species belonging to the order Squamata, distributed in 12 families and 21 genera. Colubridae is the most diverse family with six species, followed by Dipsadidae (four species), Boidae, Gymnophthalmidae, Phyllodactylidae and Teiidae with two species each, and finally Dactyloidae, Iguanidae, Elapidae, Gekkonidae, Sphaerodactylidae and Viperidae with a single species each. The species composition at this site matches what would be expected in a tropical dry forest in the region. Our study suggests that this isolated tropical dry forest fragment is the last refuge of the herpetofauna that once occupied much of the dry forests of the northern Maracaibo basin and should therefore be considered for conservation purposes.

INTRODUCTION

The tropical dry forests are one of the most threatened ecosystems in South America (Yepes and Villa 2010). These forests have suffered intense and fast modification of their soils, due to cattle ranching and agricultural expansion (Janzen 1983, Ceballos 1995). In Venezuela, these type of forests are found in the northern part of the country, mainly in the coastal range, within the central lowlands known as Llanos, the Andean cordillera de Merida and the Lake Maracaibo basin. These forests are the most degraded and fragmented forest ecosystem in the whole country, and only ca. 10% of its original extent remain (Fajardo *et al.* 2005).

Studies on reptiles of the lake Maracaibo basin region mainly consist in inventories carried on in limited geographic areas, such as Cienagas de Juan Manuel (Sur del Lago), Serranía de Perijá and Península de La Guajira (*e.g.* Alemán 1953; Pirela *et al.* 2006; Infante-Rivero 2009), and in descriptions of new species (*e.g.* Schargel *et al.* 2007). In recent years, research has mainly focused on the evaluation of the conservation status of some turtles and crocodilians (*e.g.* Rivas *et al.* 2007, Barros *et al.* 2010). Only approximately 12% (3,522 km²) of the Lake Maracaibo basin original dry forest remain (Portillo-Quintero *et al.* 2012). One of the main dry forest remnants in the western coast of the Maracaibo lake basin is located in the vicinity of the Maracaibo botanical garden (JBM for its Spanish acronym) and the “La Chinita” International Airport, located a few kilometres from the city of Maracaibo in the municipality of San Francisco, Zulia state. The main goal of this work was to provide new data on the composition of squamate reptiles in this dry forest remnant, as a result of a one-year long fieldwork at the vicinity of Maracaibo dry forest ecoregion. Comments on some aspects of their natural history and taxonomy are given.

MATERIALS AND METHODS

Study site

The study was carried out in a tropical dry forest remnant, approximately 20 Km S of Maracaibo city, Zulia State, northwestern Venezuela (10°35'17.35" N, 71°42'36.15" W, Figure 1). The locality represents an isolated forest fragment that originally was a densely forested region within the Maracaibo dry forest region. Currently, very small fragmented areas of deciduous dry forests are found west and east of Lake Maracaibo. The forest fragment is approximately 450 ha and is surrounded by very active anthropogenic activity including croplands, farms, highways, houses and an international airport.

Some of the species that dominate the floral composition of this fragment include *Tabebuia* spp., *Caesalpineia* spp., *Pithecellobium* spp., *Pereskia* spp. and *Capparis* spp. Nocturnal and diurnal visits to the study site have also indicated the presence of a grey fox population (*Cerdocyon thous*).

Regarding climatic conditions, evapotranspiration exceeds precipitation for about 9 months (dry season) between December and August, while the rainy season occurs from September to November. Light showers occur from March to June stimulating changes in plant-animal interactions.

Data collection

The fieldwork was carried out by two people (JTL and Franco Licano), from January to December 2011, four days per month, totaling a sampling effort of 576 man-hour. Specimens were captured by the active-searching method during both day and night (from morning to noon and from late evening to night). To handle specimens, we used hooks or leather gloves when necessary, mainly to avoid bites of big snakes such as *Corallus ruschenbergeri*.

When pertinent, pholidosis, snout vent length (SVL, in mm), tail length (TL, in mm), and data on coloration are provided. Taxonomy mostly follows Rivas *et al.* (2012), anole classification follows Nicholson *et al.* (2012). Voucher specimens were deposited in the reptile collection of the Museo de Biología, Facultad Experimental de Ciencias, Universidad del Zulia, Maracaibo, Venezuela (MBLUZ).

RESULTS AND DISCUSSION

We report a total of 24 species (Table 1) belonging to the order Squamata, distributed in 12 families and 21 genera. Colubridae is the most diverse family with six species, followed by Dipsadidae (four species, Figure 2A), Boidae, Gymnophthalmidae, Phyllodactylidae and Teiidae with two species each, and finally Dactyloidae, Iguanidae, Elapidae, Gekkonidae, Sphaerodactylidae and Viperidae with a single species each.

Comparing our results (see Table 1) to other studied areas, we notice that the number of snake species found at JBM is not much different when compared to that recorded from the Palmar River (Lancini 1962), a place close to the study area (approximately 50 km) and mostly composed of savannas and gallery forest. Likewise, our results do not significantly differ from the inventory conducted by Infante-Rivero (2009) for the Venezuelan side of the Península de la Guajira, approximately 130 km NW, an area characterized by dunes and thorny scrub habitats.

Infante-Rivero (2009) reports a total of 24 species of squamate reptiles from the Venezuelan Guajira, from

which 18 species (75 %) also occur within our study site. The remaining six species not collected in JBM were: (1) *Norops onca*, a species from thorny scrub habitats close to shoreline, (2) *Norops planiceps* (as *Anolis chrysolepis*), probably a misidentification because there are no records of any species of the *N. chrysolepis* species group from the Maracaibo Lake basin (D'Angiolella *et al.* 2011). Likewise, to our knowledge *N. planiceps* has not been recorded from xerophytic environment, (3) *Gonatodes petersi* a forest species from Serranía de Perijá, which is restricted to this mountain chain (Rojas-Runjaic and Infante-Rivero 2008). Infante-Rivero (2009) cited four specimens of *Gonatodes petersi* from La Guajira. According to the collector, the collecting locality is characterized by thorny scrub habitat, which does not correspond with the known habitat for the species. We had the opportunity to examine these specimens, and after close inspection, these were re-identified as *G. albogularis*, a common species in the study area. Three of the four specimens are males, with a vertical white line in the pre-humeral region that is easily visible on preserved specimens. Rivero-Blanco (1979) mentioned “sometimes, a thin vertical bluish line lies in the prehumeral region” (apparently in life). This vertical humeral line has also been observed in some specimens from Barquisimeto, a locality located 386 Km SE from La Guajira, (4) *Porthidium lansbergii*, (5) *Ameiva bifrontata*, and (6) *Lygophis lineatus* (as *Liophis lineatus*). The species listed by Infante-Rivero (2009) as *Ameiva ameiva* (an Amazonian species *sensu* Ugueto and Harvey 2011) corresponds to *A. praesignis* (Figure 2B), while the mention of *Thamnodynastes pallidus* (a Guiano-Amazonian species, see Bailey *et al.* 2005) in Infante-Rivero's (2009) table 1, could be *T. paraguanae* as later mentioned by the author in the appendix of specimens examined.

The common house gecko, *Hemidactylus frenatus*, is a species introduced to Venezuela (Rivas Fuenmayor *et al.* 2005, Rivas *et al.* 2012) and is well adapted to anthropogenic environments. It is often encountered on, or associated to human buildings. Native species of geckos such as *G. albogularis*, *Phyllodactylus ventralis*, and *Thecadactylus rapicauda* were found in both anthropogenic and natural environments within the study site. *Ameiva praesignis* as well as *Mastigodryas boddaerti* are scrub and forest species, they are replaced by *A. bifrontata* and *M. pleii*, respectively, in more open habitats (Infante-Rivero 2009, the authors pers. obs.). Although there is no record of *A. bifrontata* in the study area, the species might inhabit adjacent areas outside the forest. The species *Norops auratus*, *Iguana iguana* and *Boa constrictor* were recorded for the area but not collected.

We tentatively identify the specimen MBULZ 1189 as *Leptodeira bakeri*. This species is known only from Aruba Island, Dutch West Indies (Ruthven 1936, Duellman 1958) and on the adjacent Peninsula de Paraguana on mainland Venezuela (Mijares-Urrutia *et al.* 1995). MBULZ 1189 is a female and fits well the description given by Duellman (1958, Lopes-Costa comm. pers.), except that it has 80 subcaudals. Duellman (1958) recorded 71–90 subcaudals in female specimens of *L. a. ashmeadii*, 78–98 in *L. s. ornata* and 63–71 in *L. bakeri*. Additional data about our specimen are the following: 19-19-15 scale rows, 415 mm SVL, 148 mm TL, 22 brown dorsal body blotches, the

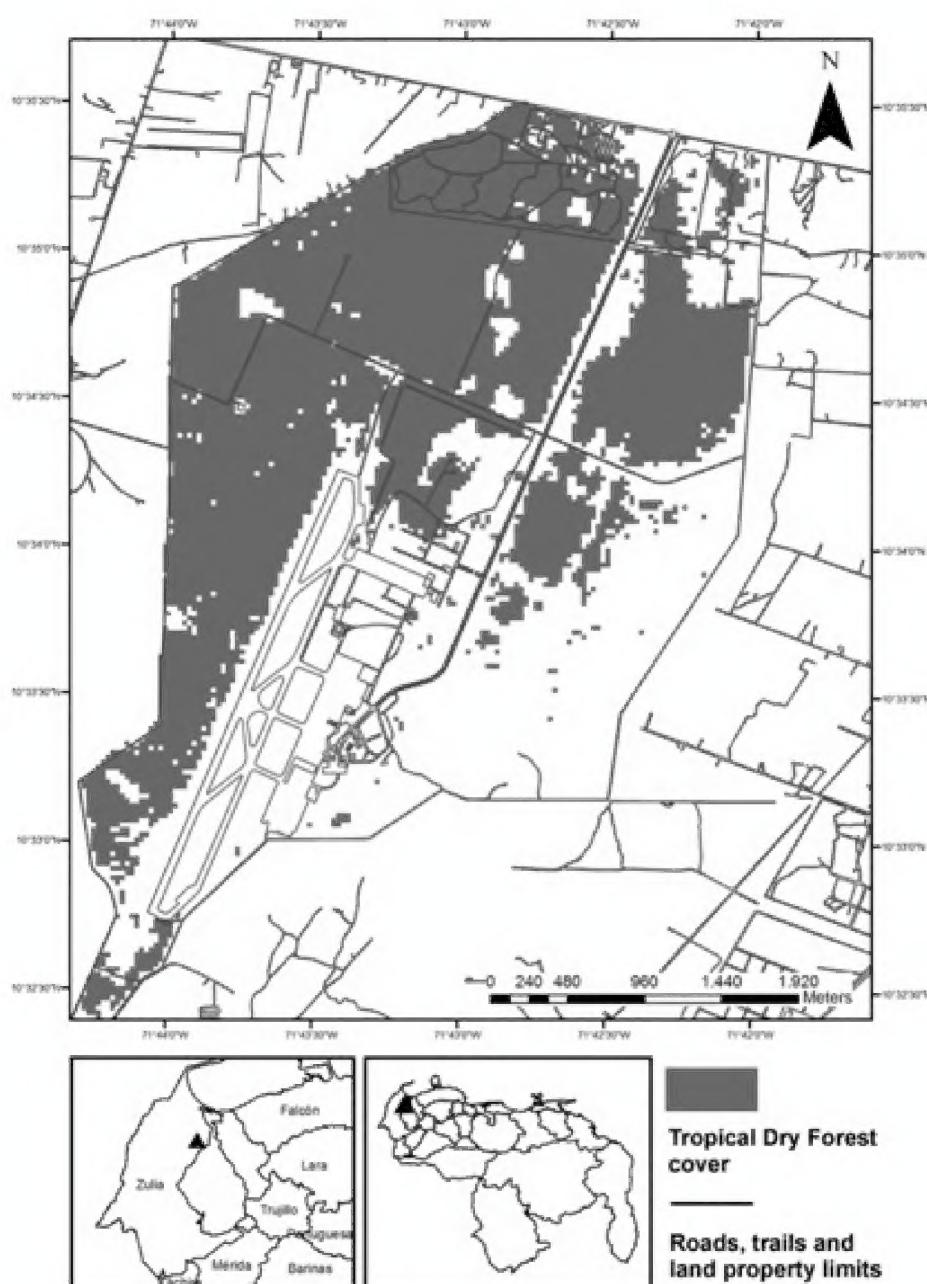


FIGURE 1. Location of the study site. The dry forest fragment is approximately 450 ha and is surrounded by very active anthropogenic activity including croplands, farms, highways, residential areas and an international airport.

first blotch being single in the nuchal region (second-third fused and fourteen-fifteen fused), and 10 dark tail blotches. Venter pale immaculate. We refer this specimen to *L. bakeri* mainly because the presence of a single bar on nape (vs two wide, distinct, longitudinal dark bars on nape in *L. a. ashmeadii*), body blotches large, 14–27 in number (vs 29–51 of *L. a. ashmeadii*), extending to or nearly to the ventrals, and the lack of an ornate head pattern. This finding of *L. bakeri* in the Lake Maracaibo basin repeats a geographic distribution pattern also found in other snakes such as *Coluber mentovarius centralis* and *Thamnodynastes paraguanae*. Thus, the record of *L. septentrionalis ornata* close to the study area (Lancini 1962) needs to be reconsidered in order to verify the exact distribution of both species, and if the population from Rio Palmar really belongs to *L. s. ornata*. This is the first mention of the species for the Lake Maracaibo basin (Rivas et al. 2012).

Our collecting of three specimens of *Tantilla semicincta* is an interesting finding because it is an uncommon snake in Venezuela. This species has only been recorded from the northwestern part of the country (Maracaibo basin, Sierra de Perija, Cordillera de Merida and Falcón state) and Caracas in the central coastal range (Rivas et al. 2012). In the Central coastal range, this species is apparently known from two specimens only (Roze 1966). All specimens examined in the different Venezuelan collections show a banded pattern, which consists of dark transverse bands on a pale ground color. However, another morphotype of this species has also been recorded from both Colombia and Venezuela: a pattern consisting of a dark dorsolateral stripe on a pale background. Except the specimens used in the description of *Homalocranion lineatum* Fischer 1883, a

taxon described from Maracaibo and later synonymised with *T. semicincta* by Boulenger (1896), there are no additional specimens collected in Venezuela with this pattern. All three *T. semicincta* we collected are females and exhibit the usual banded pattern. The specimen MBLUZ 1191 (SVL 303+TL 33, incomplete tail) has 16 dark bands of the body and two tail dark bands; MBLUZ 1192 (SVL 303+TL 75) has 16 dark bands and five on the tail, while MBLUZ 1193 (SVL 430+TL 112, Figure 2C) has 16 bands on the body and six on the tail. These numbers of bands on body and tail fall within the variation given by Wilson (1976), but are higher than in the specimen from Caracas. Wilson noted that the number of diagnostic characters (mainly number of dark tail bands, among other characteristics) between the specimens from coastal range of Venezuela and those from the western populations (western Venezuela and adjacent Colombia) differs but the scarcity of specimens did not permit a decision to be made about the identity of the Caracas population compared to the western populations.

Among the snakes, two (maybe three) are potentially dangerous to humans and represent a possible public health concern. One of them, the South American rattlesnake *Crotalus durissus*, has a low frequency of occurrence in the region and seems not to represent a major threat to humans because there is no known recent accidents by *C. durissus* in the study area. The pygmy coral snake, *Micrurus dissoleucus* (Figure 2D), is quite common but its small size poses little threat and no accidents are reported. Nevertheless, this species may be the most killed snake by local people. Lansberg's hog-nosed pitviper (*Porthidium lansbergii*) was also recorded by Lancini (1962) but has



FIGURE 2. Some specimens of squamate reptiles found in the dry forest in the Jardín Botánico from Maracaibo: A. *Phimophis guianensis* (MBLUZ 1183); B. *Ameiva praesignis* (uncollected); C. *Tantilla semicincta* (MBLUZ 1193); D. *Micrurus dissoleucus* (uncollected); Photos by Luis A. Rodríguez Jaraba.

TABLE 1. List of squamate reptiles recorded from the study area.

LIST OF SPECIES
ORDER SQUAMATA
FAMILY IGUANIDAE Oppel, 1811
Genus <i>Iguana</i> Laurenti, 1768
<i>Iguana iguana</i> (Linnaeus, 1758)
FAMILY DACTYLOIDAE Fitzinger, 1843
Genus <i>Norops</i> Wagler, 1830
<i>Norops auratus</i> Daudin, 1802
FAMILY SPHAERODACTYLIDAE Underwood, 1954
Genus <i>Gonatodes</i> Fitzinger, 1843
<i>Gonatodes albogularis</i> (Duméril and Bibron, 1836)
FAMILY GEKKONIDAE Gray, 1825
Genus <i>Hemidactylus</i> Gray, 1825
<i>Hemidactylus frenatus</i> Schlegel, 1836
FAMILY PHYLLODACTYLIDAE Gamble, Bauer, Greenbaum and Jackman, 2008
Genus <i>Phyllodactylus</i> Gray, 1828
<i>Phyllodactylus ventralis</i> O'Shaughnessy, 1875
Genus <i>Thecadactylus</i> Oken, 1817
<i>Thecadactylus rapicauda</i> (Houttuyn, 1782)
FAMILY GYMNOPTHALMIDAE Merrem, 1820
Genus <i>Gymnophthalmus</i> Merrem, 1820
<i>Gymnophthalmus speciosus</i> (Hallowell, 1861)
Genus <i>Tretioscincus</i> Cope, 1862
<i>Tretioscincus bifasciatus</i> Shreve, 1947
FAMILY TEIIDAE Gray, 1827
Genus <i>Ameiva</i> Meyer, 1795
<i>Ameiva praesignis</i> Cope, 1862
Genus <i>Cnemidophorus</i> Wagler, 1830
<i>Cnemidophorus</i> sp. (Linnaeus, 1758)
FAMILY BOIDAE Gray, 1842
Genus <i>Boa</i> Linnaeus, 1758
<i>Boa constrictor</i> Linnaeus, 1758
Genus <i>Corallus</i> Daudin, 1803
<i>Corallus ruschenbergerii</i> (Cope, 1876)
FAMILY COLUBRIDAE Cope, 1886
Genus <i>Coluber</i> Linnaeus, 1758
<i>Coluber mentovarius</i> (Duméril, Bibron and Duméril, 1854)
Genus <i>Mastigodryas</i> Amaral, 1843
<i>Mastigodryas boddaerti</i> (Sentzen, 1796)
<i>Mastigodryas pleei</i> (Duméril, Bibron and Duméril, 1854)
Genus <i>Oxybelis</i> Wagler, 1830
<i>Oxybelis aeneus</i> (Wagler, 1824)
Genus <i>Tantilla</i> Baird y Girard, 1853
<i>Tantilla melanocephala</i> (Linnaeus, 1758)
<i>Tantilla semicincta</i> (Duméril, Bibron and Duméril, 1854)
FAMILY DIPSADIDAE Bonaparte, 1838
Genus <i>Lygophis</i> Fitzinger, 1843
<i>Lygophis linneatus</i> (Linnaeus, 1758)
Genus <i>Leptodeira</i> Fitzinger, 1843
<i>Leptodeira</i> cf <i>bakeri</i> Ruthven, 1936
Genus <i>Phimophis</i> Wagler, 1830
<i>Phimophis guianensis</i> (Troschel in Schomburgk, 1848)
Genus <i>Thamnodynastes</i> Wagler, 1830
<i>Thamnodynastes paraguanae</i> Bailey and Thomas, 2007
FAMILY ELAPIDAE Boie, 1827
Genus <i>Micrurus</i> Wagler, 1824
<i>Micrurus dissoleucus</i> (Cope, 1860)
FAMILY VIPERIDAE Gray, 1825
Genus <i>Crotalus</i> Linnaeus, 1758
<i>Crotalus durissus</i> Linnaeus, 1758

not been collected in our study site even though it could live there because of its proximity to the Palmar River.

Some species that could inhabit the study area but were not observed in our survey are: *Ameiva bifrontata*, *Drymarchon caudomaculatus*, *Leptophis ahaetulla occidentalis*, *Mabuya zuliae* and *Liotyphlops albirostris*. It should be noted that another species of *Drymarchon*, *D. melanurus*, was recorded from Palmar River by Lancini (1962) but not found at our study site. According to Lancini (1962), the single specimen collected by him had a whitish head and a dark brown, almost black, body. This description corresponds better to the description of the recently described *D. caudomaculatus*, a taxon restricted to the lowlands of northwestern Venezuela and adjacent Colombia (Peninsula de la Guajira) (Wüster *et al.* 2005, Mendoza and Fernandez Lucero 2009). Wüster *et al.* (2005) mention that the lack of any obvious change of hue along the dorsal side of the body differentiates *D. caudomaculatus* from *D. melanurus*. Additionally, the locality is more appropriate to *D. caudomaculatus* than to *D. melanurus*, which is a species that inhabits premontane forest. This is also supported by the collection of two additional specimens on the road El Molinete-Carrasquero (MBLUZ 1171) and at km 106 on the road Maracaibo-Machiques (MBLUZ 987) located at 80 km N and 100 km S respectively from the study site. Infante-Rivero *et al.* (2005) also extend to 100 km SW of JBM. We conclude that the specimen identified as *D. melanurus* by Lancini (1962) is very probably a *D. caudomaculatus*.

To conclude, the JBM is an area of conservation priority because it represents a relict zone for the floristic and faunistic biodiversity of the disappearing dry forests and plains of Maracaibo. The excessive urban pressure and uncontrolled development of the city of Maracaibo eliminated most of the original vegetation and, as a consequence, extirpated many organisms, such as reptiles that nowadays find refuge mainly in the JBM. On the other hand, many semi-forested areas surrounding the city of Maracaibo are now drastically altered or modified with the inclusion of trees and ornamental shrubberies, mainly non-indigenous plants.

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APPENDIX 1. Specimens examined from Jardin Botanico de Maracaibo, municipio San Francisco, Estado Zulia, Venezuela.

Dactyloidae: *Norops auratus* (MBLUZ 1201). Gekkonidae: *Hemidactylus frenatus* (MBLUZ 1186). Phyllodactylidae: *Phyllodactylus ventralis* (MBLUZ 1184), *Thecadactylus rapicauda* (MBLUZ 1181). Gymnophthalmidae: *Gymnophthalmus speciosus* (MBLUZ 1174-1177). Teiidae: *Ameiva praesignis* (MBLUZ 1188), *Cnemidophorus* sp. (MBLUZ 1178. 1180). Boidae: *Corallus ruschenbergerii* (MBLUZ 1185). Colubridae: *Coluber mentovarius* (MBLUZ 1182), *Mastigodryas boddaertii* (MBLUZ 1196), *Mastigodryas pleei* (MBLUZ 1195), *Oxybelisa aeneus* (MBLUZ 1187), *Tantilla melanocephala* (MBLUZ 1179), *Tantilla semicincta* (MBLUZ 1191-1193). Dipsadidae: *Leptodeira* aff. *bakeri* (MBLUZ 1189), *Phimophis guianensis* (MBLUZ 1183), *Thamnodynastes paraguanae* (MBLUZ 1194). Elapidae: *Micrurus dissolculus* (MBLUZ 1190).

APPENDIX 2. Additional specimens examined.

Sphaerodactylidae: *Gonatodes albogularis*: Estado Lara: Barquisimeto (EBRG 5232). Colubridae: *Drymarchon caudomaculatus*: Estado Zulia: carretera El Molinete-Carrasquero (MBLUZ 1171); km 106 de la carretera Maracaibo-Machiques (MBLUZ 987). Dipsadidae: *Thamnodynastes paraguanae*: terrenos de la Facultad Experimental de Ciencias, La Universidad del Zulia, Maracaibo (MBLUZ 1197).

NOTE ADDED IN PROOF

While our manuscript was in press, one of us (JTL) observed several specimens of *Ameiva bifrontata* in the JBM, which one was collected (MBLUZ 1229). According to this new finding, the number of species in the study area increased to 25 species.